DOCUMENT RESUME

ED 350 764 EC 301 571

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TITLE	Conceptual Framework: Special Education Technology. Identifying Emerging Issues and Trends in Technology for Special Education.
INSTITUTION	COSMOS Corp., Washington, DC.
SPONS AGENCY	Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE	Jun 92
CONTRACT	HS90008001
NOTE	14p.; For related documents, see EC 301 540, EC 301 568-574.
PUB TYPE	Information Analyses (070) -- Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Career Education; Demography; *Disabilities; Economic Factors; Educational Sociology; *Educational Technology; *Futures (of Society); Models; Sociocultural Patterns; *Special Education; Teacher Education; *Trend Analysis

ABSTRACT

As part a 3-year study to identify emerging issues and trends in technology for special education, this paper proposes a conceptual framework specifying critical assumptions and predictions. Specifically addressed are assumptions in the areas of future home and family programs. The United States is seen by authors quoted in this review of the literature as operating under a derivative of structure, redistribution of populations, the aging of Americans, and technological change in family life. Implications for special education program design features are discussed in terms of rationale and assumptions (i.e., increased percentages of poor and disadvantaged children, increased numbers of students with limited English proficiency, and problems of access to new technologies). New tools identified include: high bandwidth computer communications networks, intelligent tutoring system/articulate expert programs, developmental cognitive technologies, and large-scale organizational electronic interfaces. Training and professional development in special education is briefly considered including vocational training for students and professional development for teachers and related staff. (Contains 12 references.) services. (Contains 10 references.) (DB)

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Identifying Emerging Issues and Trends in Technology for Special Education

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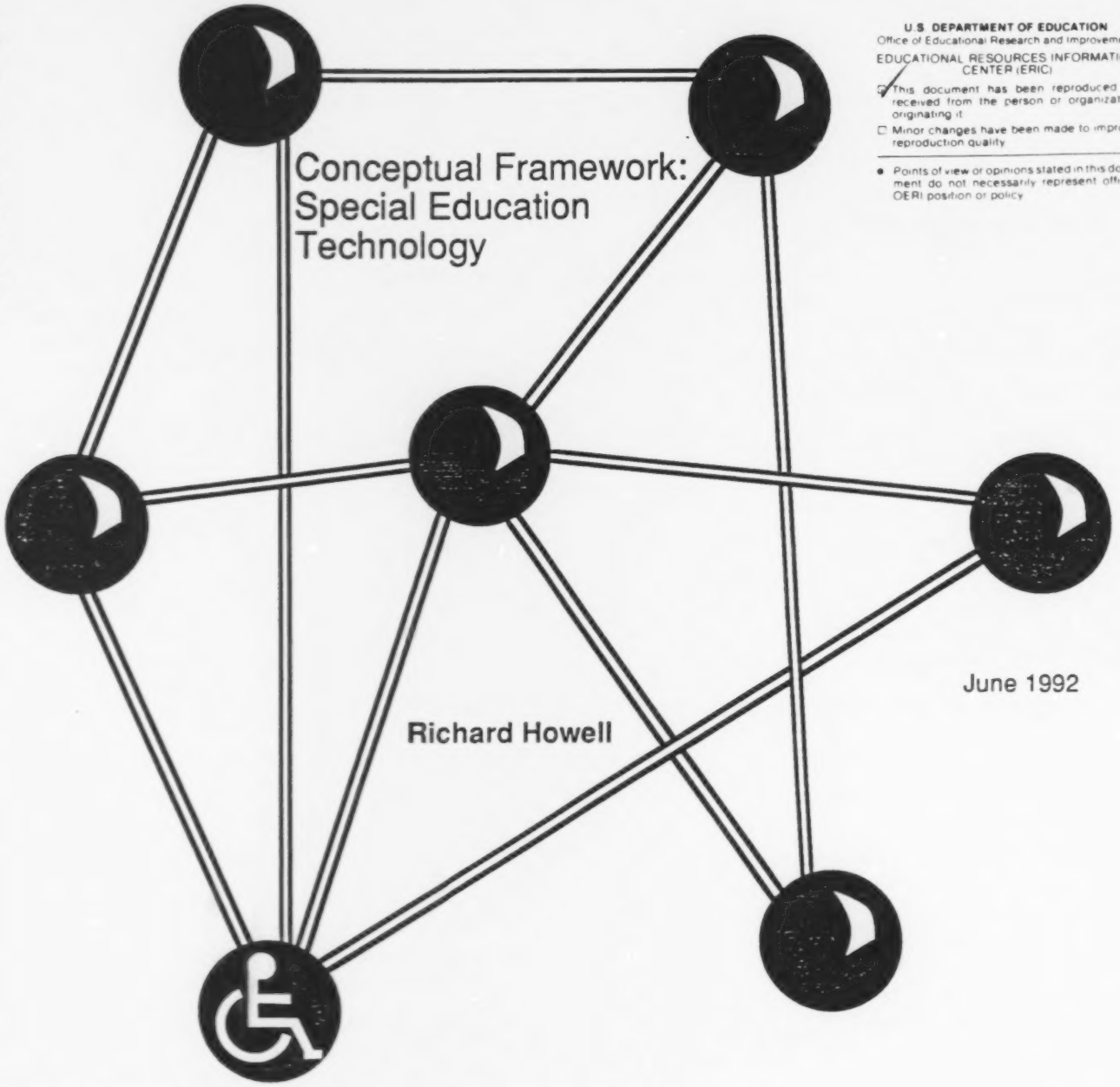

June 1992

Richard Howell

EC 301571

Prepared by COSMOS Corporation for:
U.S. Department of Education
Office of Special Education Programs
under Contract No. HS90008001

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PREFACE

COSMOS Corporation is conducting a study of the issues and trends affecting the role technology will have in the 21st century for individuals with disabilities. This three-year study is funded by the U.S. Department of Education, Office of Special Education Programs (OSEP), under Contract No. HS90008001.

COSMOS Corporation was founded in 1980, and is located in Washington, D.C. Since its inception, the firm has conducted a wide range of applied social science projects for public and private organizations and foundations. COSMOS's specialties include: conduct of case studies; identification and validation of exemplary practices; evaluation of education, job training, and human services programs; provision of technical assistance to state and community agencies; and strategic planning for public agencies and public firms.

Project participants include expert panels, project fellows, an advisory board, a consortia of practitioners, and project staff. These experts in the fields of technology and special education have come together to examine the issues and trends in these two fields, and how they impact the use of technology for special education in the 21st century. Three expert panels have started examining these issues: one with a focus on technology outside the field of education, one on special education instruction, and one on evolving service delivery systems in special education. Over the three year period their research will be synthesized and become the basis for predictions about the future.

This document is one of the papers commissioned in the first year. The purpose of the paper is to present information on one or more issues as part of the expert panel discussions. It is being shared with people inside and outside of the project to stimulate discussion on the impact of technology in the early 21st century. Readers are welcome to comment on these findings and contact COSMOS Corporation for further information.

PAPERS AVAILABLE FROM COSMOS

The papers commissioned by the project are available upon request include:

"Technology and Interactive Multimedia" by Ray Ashton;

"VLSI Technology: Impact and Promise" by Magdy Bayoumi;

"Conceptual Framework: Special Education Technology" by Richard Howell;

"Demographic Characteristics of the United States Population: Current Data and Future Trends" by Beth Mineo;

"School Reform and Its Implications for Technology Use in the Future" by John Woodward;

"Textbooks, Technology, and the Public School Curricula" by John Woodward;

"Workforce 2000 and the Mildly Handicapped" by John Woodward;

"Virtual Reality and Its Potential Use in Special Education" by John Woodward; and

"Annotated Bibliography: Training, Education Policy, Systems Change, and Instruction" by Lewis Polsgrove.

Copies of these reports are available upon request.

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CONCEPTUAL FRAMEWORK: SPECIAL EDUCATION TECHNOLOGY
WORKING GROUP #2: DICK HOWELL

"It is true that technical progress in modern times has linked men together like a complex nervous system. The means of travel are numerous and communication is instantaneous--we are joined together like cells of a single body, but this body has as yet no soul."

Antoine de Saint-Exuprey, 1943

In order to make even modestly accurate statements concerning the future events surrounding special education technology, the emergent conceptual framework must specify a number of critical assumptions/predictions in areas such as the home and family, demographic distribution, education, and economics. This set of assumptions should take the form of one or more scenarios (Goode, 1991) which, in turn, will drive the predictions of the expert panelists and provide a type of "face validity" to the finalized conceptual framework.

Home and Family Relationships in the Future

A number of factors will directly affect critical home and school relationships in the near-term future (approximately 2010-2020), including: family life, migration of populations in the U.S., aging Americans, and technological changes in the home (Boyer, 1984; Kain, 1990). These interrelated factors will dramatically affect the viability of the family in the future and the success of students in U.S. schools. The following statements are meant to provide a view of family and home life in the near-term future:

Family Life

1. There will be a proportional increase in households containing 1 or 2 individuals well into the future, despite the rising costs of single-family housing.

2. However, the average household size will vary with Black and Hispanic households being larger than White households.

3. The overall proportion of Hispanic families will continue to increase until at least the year 2010.

4. Couples who marry can expect to spend many more years together in marriage than in other historical cohorts. Large proportions of elderly women can expect to live out at least some of their later life course as widows.

5. There will likely be more "dual earner" couples, a situation which may put more stress on marriages because of the relative lack of time couples spend together.

6. There will also be a significant increase in the number of "dual career" families, in which both spouses view their employment as a "career," rather than a job.

7. Significant numbers of people are likely to spend many of their adult years in an unmarried state--either as never-married or formerly married.

Redistribution of Populations (Migration)

1. The current trend involving movement of persons from rural-to-urban and urban-to-suburban will continue well into the future.

2. However, the migration of families from East to West may slow and gradually shift to the Southern Regions of the U.S.

The Aging of Americans

1. The combinations of the "baby boomers" (cohorts born in the 1950's - 1960's) and advances in medical sciences will result in a significant growth of the population over the age of 75.

2. This will also result in greater stresses on health care services and providers, resulting in changes in the current structure of insurance and medical care in the U.S.

3. The financial responsibility for this increased and long-term usually fall on the family (as it currently does).

Technological Change in Family Life

1. Changes in contraceptive technology will continue to contribute the transformation of men's and women's work and family roles. A blurring of traditional roles of men and women will result in more men at home, more women in the workforce, and greater sharing of work within the home.

2. Other innovations in medical and health technologies will impact significantly on men's and women's work and family roles.

Home and School Interactions in the Future

Educational institutions will be forced to accommodate a number of alternative educational settings, including magnet schools, year-round schools, and home schooling over the next 20 years.

1. The large number of multi-cultural students entering the educational system will present a serious challenge to the traditional instructional strategies and materials of the schools as they are currently structured.

2. Schooling will become increasingly "privatized" through the integration of commercial telecommunications ventures (e.g. Channel 1, CNN Classroom) and other types of business/school ventures.

3. "Lifelong" learning will become an acknowledged necessity for both career changes and advancement (increases will occur both vertically and horizontally).

4. A wide-range of electronic interactions will take place between the home and school (e.g. interactive homework, teacher/student and teacher/parent communications, and study skill reinforcement).

Special Education in the Future

1. An increasing emphasis will take place in vocational and pre-vocational education as educators attempt to increase the integration of students with disabilities into the burgeoning service sector of the U.S. economy (National Council on Disability, 1989).

2. Curricular changes in special education practice will increasingly emphasize both communication skills and functional life skills as preparation for later vocations.

Special Education Program Design Features

Rationale and Assumptions. Several converging demographics and sociological trends will have significant impact on the development and evolution of program design features in special education technology in the future. These will include such things as:

1. A likely scenario in the year 2000 and lasting until at least 2020, will be a student population with ever larger percentages of poor and disadvantaged children, more children who are members of minority groups, from single parent families, and more with special needs.

2. Projections indicate that the total population of "limited English proficiency" (LEP) students will increase over 41% between 1980 and 2020 (Malcolm, 1988). Overall, minority groups will comprise over a third of the U.S. population.

3. The problem of access will remain a primary goal of special educators utilizing new technologies. Access to technologies in this case means "having technological

options that are meaningful, culturally relevant, that build on prior experiences, that respect differences between individuals, and which provide powerful tools that encourage independence in learning". (Malcolm, 1988)

New Tools

1. **High Bandwidth Computer Communications Networks:** these networks will be used to support the creation and transmission of multimedia information-text, speech, music, animated displays, and computer programs.

   * High fidelity speech synthesis and recognition devices operating in real time, and high-resolution computer graphics will enable clear communication.

2. **Intelligent Tutoring System/Articulate Expert Programs:** intelligent computer assisted instruction (ICAI) has not had a substantive impact on educational practice at this time primarily because of the lack of knowledge of the human learner and tne rules or processes which govern knowledge acquisition (West, Farmer, & Wolff, 1991). Feurzeig (1988) states that, "computer capabilities for the individualization of instruction will always be limited by the fundamental difficulty of understanding the student's state of knowledge, misconceptions, conceptual gaps, learning difficulties, and procedural bugs." Additional support for this position is given by Resnick and Johnson (1988) who said, "... we have not proceeded far enough with the broad venture of understanding human learning process. This means that our theoretical tool for modeling students are rather primitive."

   * it may be more profitable to think of computers as "intelligent extenders", or tools that will be used to complete tasks more efficiently, rather than as instructional tools.

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* progress in developing ICAI tools will depend upon our ability to identify those types of artificial intelligence which will interact broadly with human intelligence across a broad range of human activities and then design ICAI systems and training programs for human users in accordance with these new design principles.

3. **Developmental Cognitive Technologies** may be conceived of as "interactive thinking tools; (Pea, 1988) that can be used across the curriculum. Prototypes of these types of software and future advances will evolve from these early models. In general, they will evidence certain characteristics:

   * incorporate easily programmable options so that learners can mold their rules to serve their unique style of thinking and learning.

   * they will have "layers of functions associated with students'competencies, which learners would" shed like skins as they no longer need them (Pea & Kurland, 1987)

   * provide real experiences and other software-driven approximations to the kinds of "task scaffoldings and expert teacher would offer a novice who is learning the task and its relevant tasks". (Pea, 1988, p. 201)

4. **Large-scale Organizational Electronic Interfaces** for the sharing and distributions of information across "electronic communities", each having a distinctive "culture" or common rationale. This concept was first articulated by Malone, Grant and Turback (1986), who called it an "information lens." It is seen as a linking (or bridging) system between disparate cultures separated by both time and space.

   * this is an attempt to focus the yields of other's transfer experiences onto the education process.

* The "Cultural Information Transfer System" is a related concept developed by Roy Pea (1988), who visualized it as a way to collect, organize, and disseminate transfer-relevant information and knowledge in forms readily entered and used by individuals.

Training and Professional Development in Special Education

There are two interrelated dimensions involved in training and professional development in special education, each based in the population that is targeted for instruction:

1. Training for **students** in terms of vocational skill development for future employment.

2. Training for **teachers and related staff** which increases their pedagogical and/or clinical skills, and which constitutes "professional development."

Training for Students

1. The emphasis in the future will be concentrated on prevocational and vocational development. This prediction has more credence if the "Post Industrial Reform: scenario articulated by Moore (1991) becomes a reality--where greater separation occurs betweens the rich and poor and a significant number of workers with disabilities are placed in "service-type" jobs.

2. There will be wider use of "apprentice-learning models for all aspects of special education, especially at mid-and high school levels. This model might be especially effective and valuable for training complex cognitive domains such as physics, mathematics, and linguistics.

Training for Teachers. There is some reason for pessimism in the long-term projections for teacher training/education efforts. Historically, the record of investment in teacher productivity is somewhat less that optimistic. According to Pearlman (1989), "less capital is invested behind teacher productivity than in any other profession ($1000/teacher vs. $50,000/worker throughout all industry)." In addition, education has the lowest level of research and development (80 times less than the average in American business).

Potential vehicles for teacher training in the future include such ideas as:

1. In-school experimentation utilizing RFP-like processes to teachers and teams of teachers to propose innovative uses of new technologies in their classrooms/schools. This would tend to decentralize technical resources in the schools and spur creativity at the building level.

2. Distance education concepts and technologies will be utilized to deliver coursework in both urban and rural settings. Teachers will use telecommunication tools to share their ideas across both time and space. The continuing problem of certification and training for teachers in rural areas will be partially solved through the use of two-way interactive television and telecommunication tools.

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